The Pending Claims

Claims 1, 2, 5-7, 9-18, and 21 are pending currently. Claims 1, 2, 5-7, and 9-18 are directed to the water-soluble luminescent semiconductor quantum dot. Claim 21 is directed to the composition. Reconsideration of the pending claims is respectfully requested.

The Amendments to the Claims

Claims 3, 4, 8, 19, 20, 22, 23, 38, and 39 have been canceled without prejudice or disclaimer of the subject matter contained therein. Applicants expressly reserve the right to pursue the canceled claims in a continuation or divisional application. Claim 1 has been amended to incorporate the features of claims 3 and 4. As a result, claims 3 and 4 have been canceled as superfluous. Claim 2 has also been revised to be consistent with amended claim 1 so as to clarify that the sulfur atom already has antecedent basis in claim 1. Furthermore, the dependencies of claims 5-7 have been corrected so that they now refer to claim 1. No new matter has been added by way of these amendments. Separate documents setting forth the precise changes to the claims as well as the text of all of the pending claims are enclosed herewith.

Summary of the Office Action

Claims 1-18 are rejected under 35 U.S.C. § 112, second paragraph. The Office Action rejects claims 1-6, 9-14, 17-18, 21, and 38-39 under Section 102(e), as allegedly being anticipated by U.S. Patent 5,990,479 (Weiss et al.). Claims 7-8 are rejected under 35 U.S.C. § 103(a), as allegedly being obvious in view of Weiss et al., taken in view of Lawless et al. (*Journal of Physical Chemistry, 99*, 10329 (1995)). Claims 15-16 are rejected under 35 U.S.C. § 103(a), as allegedly being obvious in view of Weiss et al., taken in view of Hines et al. (*Journal of Physical Chemistry, 100*(2), 468 (1996)). Claims 19-20 and 22-23 are rejected under 35 U.S.C. § 103(a), as allegedly being obvious in view of Weiss et al, taken in view of Hines et al. and Lawless et al.

Discussion of Section 112, second paragraph Rejection

According to the Office Action, claim 1 is indefinite because of the phrase "at least about one day." The claims have been amended to remove the word "about." Applicants respectfully request that the rejection be withdrawn.

Discussion of Anticipation and Obviousness Rejections

The anticipation and obviousness rejections are moot inasmuch as the cited references (alone or in combination) do not disclose or reasonably suggest the present invention as recited in the revised pending claims.

In particular, claim 1 has been amended to recite the feature that the hydrophilic attachment group is an organic group comprising a sulfur atom and at least one hydrophilic substituent selected from the group consisting of a sulfonic acid or salt thereof, a sulfamic acid or salt thereof, an amino substituent, a quaternary ammonium salt, and a hydroxy. The cited references, even when combined, do not meet at least this feature of the pending claims.

Weiss et al. teaches a luminescent quantum dot and at least one linking agent that is connected to the quantum dot via one end, and the distal end of the linking agent can link to an affinity molecule, such as 3-aminopropyltrimethoxysilane and (4-mercapto)benzoic acid. The present invention, as defined by the pending claims, is not anticipated by Weiss et al. because Weiss et al. does not disclose or suggest that the hydrophilic attachment group is an organic group comprising a sulfur atom and at least one hydrophilic substituent selected from the group consisting of a sulfonic acid or salt thereof, a sulfamic acid or salt thereof, an amino substituent, a quaternary ammonium salt, and a hydroxy. Moreover, the revised pending claims are not rendered obvious either since Weiss et al. does not teach or suggest preparing a quantum dot with any hydrophilic attachment group, let alone the hydrophilic attachment groups recited in the revised pending claims.

Furthermore, Lawless et al. and Hines et al. do not cure the deficiencies of Weiss et al. such that the pending claims are not rendered obvious even if the references are combined. Referring first to Lawless et al., the Office Action recognizes that it teaches a different structure than the quantum dots of the invention and merely cites the reference in light of the nature of its linker. In this regard, Lawless et al. teaches preparing CdS quantum dots that are bridged to titanium dioxide (TiO_2) particles via a mercaptocarboxylic acid linker such that one of ordinary skill in the art would not arrive at the present invention, as defined by the pending claims, even if Weiss et al. and Lawless were combined. Particularly, Weiss et al. and Lawless et al. in combination do not meet the feature of a quantum dot that comprises a core/cap structure in combination with a hydrophilic attachment group, wherein the hydrophilic attachment group is an organic group comprising a sulfur atom and at least one hydrophilic substituent selected from the group consisting of a sulfonic acid or salt thereof, a sulfamic acid or salt thereof, an amino substituent, a quaternary ammonium salt, and a hydroxy. Lawless et al. does not teach or suggest any other type of linker other than the mercaptocarboxylic acid linker. Further, there is no motivation to modify the linker

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of Lawless et al. since the mercaptocarboxylic acid linker was selected in Lawless et al. for the carboxylic acid's affinity to bind to TiO_2. Nothing in Lawless et al., or Weiss et al. for that matter, teaches or suggests a hydrophilic attachment group as defined in the pending claims that would render a quantum dot soluble in water for at least one day.

Hines et al. teaches preparing quantum dots with a CdSe core and a ZnS cap. Hines et al. does not teach or suggest a hydrophilic attachment group of any sort. Therefore, the combination of Weiss et al. and Hines et al. does not result in the present invention as defined by the pending claims. Therefore, Weiss et al. and Hines et al. do not render the present invention obvious.

Without a motivation to modify the teachings of Weiss et al., Lawless et al., and/or Hines et al. to achieve the present invention as recited in the revised pending claims, these references cannot be said to render the pending claims obvious. Accordingly, the anticipation and obviousness rejections should be withdrawn and the application allowed.

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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Date: April 8, 2002

In re Appln. of Nie et al.
Application No. 09/405,653

CERTIFICATE OF FACSIMILE

I hereby certify that this RESPONSE TO OFFICE ACTION (along with any documents referred to as being attached or enclosed) is being transmitted by Facsimile, with a confirmation via First Class Mail to Examiner Christopher L. Chin, c/o Commissioner for Patents, Washington, D.C. 20231 at fax no. (703) 308-4242.

Date: 4-8-02 Debbie Hall

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RESPONSE UNDER 37 CFR 1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 1641

PATENT
Attorney Docket No. 202406

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Nie et al.

Application No. 09/405,653

Filed: September 24, 1999

Art Unit: 1641

Examiner: C. Chin

For: WATER-SOLUBLE LUMINESCENT QUANTUM DOTS AND BIOMOLECULAR CONJUGATES THEREOF AND RELATED COMPOSITIONS AND METHODS OF USE

AMENDMENTS TO CLAIMS MADE IN RESPONSE TO OFFICE ACTION DATED NOVEMBER 6, 2001

(Deletions are indicated by brackets, while additions are indicated by underlining)

1. (Twice Amended) A water-soluble luminescent semiconductor quantum dot, which comprises a core, a cap and a hydrophilic attachment group, wherein said hydrophilic attachment group is an organic group comprising a sulfur atom and at least one hydrophilic substituent selected from the group consisting of a sulfonic acid or salt thereof, a sulfamic acid or salt thereof, an amino substituent, a quaternary ammonium salt, and a hydroxy, wherein the water-soluble luminescent semiconductor quantum dot remains in solution for at least [about] one day.

2. (Amended) The water-soluble luminescent semiconductor quantum dot of claim 1, wherein the hydrophilic attachment group is attached to said quantum dot via [a] the sulfur atom.

3. (Canceled)

4. (Canceled)

5. (Amended) The water-soluble luminescent semiconductor quantum dot of claim [3] 1, wherein said organic group is a C_1-C_6 alkyl group or an aryl group.

6. (Amended) The water-soluble luminescent semiconductor quantum dot of claim [3] 1, wherein said organic group is a C_1-C_6 alkyl group.

7. (Amended) The water-soluble luminescent semiconductor quantum dot of claim [3] 1, wherein said hydrophilic attachment group is a [thiol carboxylic acid or] thiol alcohol.

8. (Canceled)

19. (Canceled)

20. (Canceled)

22. (Canceled)

23. (Canceled)

38. (Canceled)

39. (Canceled)